Commonwealth of Massachusetts
Executive Office of Energy & Environmental Affairs

Department of Environmental Protection
Northeast Regional Office • 205B Lowell Street, Wilmington MA 01887 • 978-694-3200

DEVAL L. PATRICK
Governor

RICHARD K. SULLIVAN JR.
Secretary

KENNETH L. KIMMELL
Commissioner

Draft
Prevention of Significant Deterioration Permit
Fact Sheet

Salem Harbor Redevelopment Project
24 Fort Avenue
Salem, MA

Transmittal No. X254064
Application No. NE-12-022

I. General Information

Name of Source:	Salem Harbor Redevelopment (SHR) Project
Location:	Salem, Massachusetts
Applicant's Name and Address:	Footprint Power Salem Harbor Development LP 1140 Route 24 East, Suite 303 Bridgewater, NJ 08807
Application Prepared By:	Tetra Tech 160 Federal Street Boston, MA 02110
Prevention of Significant Deterioration/ Comprehensive Plan Application Transmittal Number:	X254064
Application Number:	NE-12-022
Massachusetts Department of Environmental Protection (MassDEP) MassDEP Contact:	Cosmo Buttaro MassDEP Northeast Regional Office 205B Lowell Street Wilmington, MA 01887 (978) 694-3281 Cosmo.Buttaro@State.MA.US

On December 21, 2012, Footprint Power Salem Harbor Development LP (Footprint) submitted an initial Application to MassDEP requesting a Prevention of Significant Deterioration (PSD) Permit and a 310 Code of Massachusetts Regulations (CMR) 7.02 Major Comprehensive Plan Application Approval (Plan Approval) for a new 630 MW (692 MW with duct firing) natural gas fired quick start combined cycle electric generating facility to be located at the site of the existing Salem Harbor Station. The existing Salem Harbor Station is being shut down. Footprint submitted additional information on April 12, 2013, June 10, 2013, June 18, 2013, August 6, 2013, August 20, 2013, September 4, 2013, and September 6, 2013. MassDEP considers the Application for this Draft PSD Permit to be administratively and technically complete. On September 9, 2013, MassDEP issued a Draft PSD Permit for a 30 day public comment period.

On April 11, 2011, MassDEP and the U.S. Environmental Protection Agency Region 1 (EPA) executed an "Agreement for Delegation of the Federal PSD program by EPA to MassDEP" (PSD Delegation Agreement). This PSD Delegation Agreement directs that all Permits issued by MassDEP under the Agreement follow the applicable procedures in 40 CFR 52.21 and 40 CFR part 124 regarding permit issuance, modification and appeals.

The SHR Project is also subject to the MassDEP Plan Approval and Emission Limitations requirements under the MassDEP regulations at 310 CMR 7.02 and 310 CMR 7.00: Appendix A (Appendix A). MassDEP is concurrently issuing the Proposed Plan Approval and the Draft PSD Permit.

The Proposed Plan Approval regulates all pollutants affected by the proposed project, including the pollutants regulated under the PSD Permit, and also implements MassDEP's nonattainment New Source Review (NSR) program regulations at Appendix A. Footprint must ensure that its SHR Project complies with both the federal PSD Permit and MassDEP's Plan Approval, as well as other applicable federal and state requirements.

After reviewing the December 21, 2012 Application and additional information, MassDEP prepared this Fact Sheet and Draft PSD Permit for the proposed SHR Project as required by the PSD Delegation Agreement and 40 CFR Part 124 - Procedures for Decision Making.

MassDEP's permit decisions are based on the information and analysis provided by the Applicant (Footprint) and MassDEP's own technical expertise. This Fact Sheet documents the information and analysis MassDEP used to support the PSD Permit decisions. It includes a description of the proposed SHR Project, the applicable PSD regulations, and an analysis demonstrating how Footprint complied with all applicable requirements.

Based on all submittals, MassDEP has concluded that Footprint's Application is complete and provides the necessary information showing the SHR Project meets federal PSD regulations. MassDEP is making Footprint's submitted information part of the official record for this Fact Sheet and PSD Permit.

II. Project Location

The proposed plant site is located in Salem, Massachusetts within the existing +/- 65 acre Salem Harbor Station property which is bounded by Fort Avenue and the South Essex Sewerage District wastewater treatment plant to the north; Salem Harbor and Cat Cove to the east and northeast; the Blaney Street Ferry terminal and several mixed-use buildings to the southeast; and by Derby Street and Fort Avenue to the west.

III. Proposed Project

Footprint proposes to construct a nominal 630 megawatt (MW) (692 MW with duct firing) quick-start, combined-cycle natural gas-fired power plant at the proposed plant site. The SHR Project will be configured as two operating units. Each unit will be able to operate independently to respond to dispatch requirements. Most of the SHR Project's equipment will be housed in a building structure that will be approximately 115,000 square feet (sf) in area. The SHR Project will include a variety of power plant equipment including: two gas turbine generators (GTGs); two steam turbine generators (STGs); two heat recovery steam generators (HRSGs) with selective catalytic reduction (SCR) and oxidation catalyst pollution control equipment; generator step-up transformers; two air cooled condensers; an ammonia storage tank; and water tanks. In addition, the SHR Project will include areas within other buildings for administrative and operating staff; warehousing of parts and consumables; and maintenance shops and equipment servicing.

Each unit of the proposed SHR Project will be a combined-cycle power plant. The first stage in the generation process will be the operation of a GTG set. Thermal energy will be produced in the GTGs through the combustion of natural gas, which will be converted into mechanical energy required to drive the turbine compressor section as well as the generator. Each gas turbine will have the capability to generate in excess of 200 MW under all environmental conditions using solely natural gas. The GTG exhaust gas still contains considerable recoverable heat energy. This heat energy will be recovered in a three pressure level HRSG to produce steam. This steam will be directed to a STG where this heat energy will be converted to electrical energy representing approximately 40 percent (%) of the total energy generated by each unit. Efficiency is enhanced in the cycle by using reheat systems as well as using waste steam to heat feedwater in the HRSG, thereby further improving the overall efficiency of the SHR Project. Once the steam leaves the steam turbine, it is condensed back to water using an air cooled condenser (ACC). This water is then returned to the HRSGs through a system of pumps and control mechanisms. Additional steam may be generated when required by the use of special burners within the HRSGs (duct firing) to increase the electricity produced by the STGs.

Footprint will be using the GE Energy 7F Series 5 Rapid Response Combined Cycle Plant for each main power block**.** Each GE power block can produce approximately 150 MW (300 MW total for the plant) of output within 10 minutes of startup using both operating units together.

Continuous emissions monitoring systems (CEMS) will sample, analyze and record fuel firing rates and nitrogen oxides (NO_x) and carbon monoxide (CO) (and ammonia (NH_3)) concentration levels, and the percentage of diluent (either oxygen or carbon dioxide) in the exhaust gas from each of the two HRSG exhaust flues. Exhaust gases will be discharged through a single 230 foot tall chimney enclosing two flues (one for each turbine/HRSG), each with a diameter of 20 feet.

Ancillary equipment at the proposed SHR Project will include three additional fuel combustion emission units:

- An 80 million British thermal units per hour (MMBtu/hr) natural gas fired auxiliary boiler equipped with ultra low-NOx burners (Cleaver Brooks "Nebraska" D-type boiler Model No. CBND 80E-300D-65 or equivalent),

- A 750 Kilowatt (KW) (standby rating) emergency generator firing ultra-low sulfur distillate oil containing no more than 0.0015 weight percent sulfur (ULSD) (Cummins Model No. DQFAA Diesel Emergency Generator or equivalent), and

- A 371 brake horsepower (BHP) fire pump engine firing ULSD oil (Cummins Model No. CFP9E-F50 or equivalent).

Footprint has requested the combined cycle turbines be permitted for year-round operation on natural gas and for the equivalent of 720 hours of operation of natural gas duct firing per rolling 12-month period. The auxiliary boiler will be limited to the equivalent of 6,570 hours of natural gas firing at full (100 percent) load per rolling 12-month period. The emergency diesel engine/generator and the fire pump will each be limited to no more than 300 hours of operation per rolling 12-month period.

IV. PSD Program Applicability and Review

MassDEP administers both the nonattainment New Source Review (NSR) program and the attainment NSR PSD program under delegation from EPA. As stated previously, the PSD program delegation is in accordance with the provisions of the April 11, 2011 PSD Delegation Agreement between MassDEP and EPA which states that MassDEP agrees to implement and enforce the federal PSD regulations as found in 40 CFR 52.21.[1]

Review considerations with respect to 310 CMR 7.00: Appendix A Emission Offsets and Nonattainment Review (Appendix A) are not part of the PSD Review Process and are therefore not addressed in this Fact Sheet. Therefore, MassDEP's evaluation of Emission Offsets and Nonattainment Review for the construction of the proposed SHR Project, as required by Appendix A, is provided in the Proposed Plan Approval.

Appendix A applies to a new major source or major modification of an existing major source located in a non-attainment area; or that is major for NO_x or VOC emissions. With respect to NO_x and/or VOC emissions, Appendix A applies for a new major source of fifty (50) or more tons per year or a major modification of an existing major source amounting to an increase of twenty five (25) or more tons per year. Appendix A requires new major sources, or major modifications thereat, to meet Lowest Achievable Emission Rate (LAER) and to obtain emission offsets at a ratio of 1.20 to 1, plus a five (5) percent set aside that must be held and can neither be sold nor used elsewhere. This yields an overall offset ratio of 1.26 to 1. LAER is defined in Appendix A as the more stringent rate of emissions of: (a) the most stringent emissions limitation which is contained in any State Implementation Plan (SIP) for such class or category of stationary source, unless the owner or operator of the proposed stationary source demonstrates that such limitations are not achievable; or, (b) the most stringent emissions limitation which is achieved in practice by such class or category of stationary source.

The PSD regulations at 52.21 require that a major new stationary source of an attainment pollutant, or major modification to an existing major stationary source of an attainment pollutant, undergo a PSD review and that a PSD Permit be granted before commencement of construction.

40 CFR 52.21(b)(1) of the federal PSD regulations defines a "major stationary source" as either (a) any of 28 designated stationary source categories with potential emissions of 100 tons per year (tpy) or more of any regulated attainment pollutant, or (b) any other stationary source with potential emissions of 250 tpy or more of any regulated attainment pollutant. Combined cycle generating facilities like the SHR Project are one of the 28 designated stationary source categories for which 100 tpy of potential emissions qualifies the source as "major."[2]

In addition, once a new stationary source has been determined to be a "major" source, it is subject to PSD review for each regulated attainment pollutant that the source would have the potential to

[1] Section III. Scope of Delegation, Section A., states, "Pursuant to 40 CFR 52.21(u), EPA hereby delegates to MassDEP full responsibility for implementing and enforcing the federal PSD regulations for all sources located in the Commonwealth of Massachusetts, subject to the terms and conditions of this Delegation Agreement."

[2] "Determining Prevention of Significant Deterioration (PSD) Applicability Thresholds for Gas Turbine Based Facilities," memorandum from Edward J. Lillis, Chief, Permits Branch, EPA, dated February 2, 1993.

emit in "significant" amounts, which in some cases is lower than the "major" thresholds. 40 CFR 52.21(b)(50)(iv) includes pollutants "subject to regulation" as defined in 40 CFR 52.21(b)(49) as regulated pollutants. For this project, Greenhouse Gas (GHG) emissions become a regulated pollutant if the project's total GHG emissions on a CO_{2e} basis equal or exceed 75,000 tpy.

If MassDEP determines a new stationary source or new modification is subject to the PSD program, the source must apply for and obtain a PSD Permit that meets regulatory requirements including:

- Best Available Control Technology (BACT) requiring sources to minimize emissions to the greatest extent practical;

- An ambient air quality analysis to ensure all the emission increases do not cause or contribute to a violation of any applicable PSD increments or NAAQS;

- An additional impact analysis to determine direct and indirect effects of the proposed source on industrial growth in the area, soil, vegetation and visibility; and

- Public comment including an opportunity for a public hearing.

V. PSD Applicability

The SHR Project is considered a major source of air pollution as defined by EPA's PSD program. Potential emissions from the proposed facility are significant for seven different PSD pollutants: NO_x, CO, PM, PM_{10}, $PM_{2.5}$, sulfuric acid (H_2SO_4) mist, and GHG. Table 1 shows potential emissions from the proposed new equipment at the site and Table 2 lists total facility potential to emit relative to the PSD major source thresholds and significance level thresholds for PSD regulated pollutants.

Table 1. Facility-Wide Annual Potential Emissions

Pollutant	CT Unit 1 (tpy) [1]	CT Unit 2 (tpy) [1]	Auxiliary Boiler (tpy) [2]	Emergency Generator (tpy) [3]	Fire Pump (tpy) [3]	Auxiliary Cooling Tower (tpy) [4]	Facility Total (tpy)
NO_x	69.9	69.9	2.9	1.7	0.4	0	144.8
CO	48.0	48.0	9.2	1.0	0.3	0	106.4
VOC	13.1	13.1	1.3	0.35	0.12	0	28.0
SO_2	14.2	14.2	0.4	0.0017	0.0006	0	28.8
PM	53.8	53.8	1.3	0.06	0.02	0.43	109.4
PM_{10}	53.8	53.8	1.3	0.06	0.02	0.43	109.4
$PM_{2.5}$	53.8	53.8	1.3	0.06	0.02	0.17	109.2
NH_3	25.5	25.5	0	0	0	0	51.0
H_2SO_4 Mist	9.4	9.4	0.03	0.00013	0.00005	0	18.8
Pb	0	0	0.00013	0.000001	0.0000003	0	0.00013
Formaldehyde	3.3	3.3	0.019	0.00009	0.0005	0	6.6
Total HAP	6.3	6.3	0.5	0.0018	0.0016	0	13.1
CO_2	1,122,920	1,122,920	31,247	180	66	0	2,277,333
GHG, CO_{2e}	1,124,003	1,124,003	31,277	181	66	0	2,279,530

Table 2. Prevention of Significant Deterioration Regulatory Threshold Evaluation				
Pollutant	**Project Annual Emissions (tons)**	**PSD Major Source Threshold (tons)**	**PSD Significant Emission Rate (tons)**	**PSD Review Applies**
CO	106.4	100	100	Yes
NO_x	144.8	100	40	Yes
SO_2	28.8	100	40	No
PM	109.4	100	25	Yes
PM_{10}	109.4	100	15	Yes
$PM_{2.5}$	109.2	100	10	Yes
VOC (Ozone precursor)	28.0	100	40	No
Pb	0.00013	100	0.6	No
Fluorides	Negligible.	100	3	No
H_2SO_4 Mist	18.8	100	7	Yes
H_2S	none expected	100	10	No
Total Reduced Sulfur (including H_2S)	none expected	100	10	No
Reduced Sulfur Compounds (including H_2S)	none expected	100	10	No
GHG (as CO_{2e})	2,279,530	100,000	75,000	Yes

Table 1 and 2 Notes:

1. Emissions, except CO emissions, for each CT are based on 8,040 hours of natural gas firing per 12 month rolling period at full (base) load (100% load) and 50ºF ambient temperature with no duct burner firing (2,130 MMBtu/hr, HHV) or evaporative cooling, and 720 hours of natural gas firing per 12 month rolling period at peak load (approximately 102% load) and 90ºF ambient temperature with 100% duct burner firing (2,449 MMBtu/hr, HHV CT and duct burner combined) and evaporative cooling, and include start-up and shutdown emissions. Worst case CO emissions for each CT are based on a typical annual operating scenario of 3,272 hours at different seasonal emission rates depending on heat input rates (loads), ambient temperatures, and duct burner/evaporative cooling status, and 36, 166, and 4 cold, warm, and hot start-up/shutdown cycles, respectively.

2. Auxiliary boiler emissions are based on 6,570 hours of natural gas firing per 12 month rolling period at 100% load (80 MMBtu/hr, HHV).

3. The emergency diesel generator (EDG) and fire pump (FP) emissions are each based on restricted operation of 300 hours per unit, including maintenance and periodic readiness testing, while firing ULSD having a sulfur content that does not exceed 0.0015% by weight.

4. The auxiliary cooling tower contributes to particulate emissions only based on 8,760 hours of operation per 12 month rolling period.

Table 1 and 2 Key:

CT = Combustion Turbine
tpy = tons per year
NO_x = Nitrogen Oxides

CO = Carbon Monoxide
VOC = Volatile Organic Compounds
SO_2 = Sulfur Dioxide
PM = Total Particulate Matter
PM_{10} = Particulate Matter less than or equal to 10 microns in diameter
$PM_{2.5}$ = Particulate Matter less than or equal to 2.5 microns in diameter
NH_3 = Ammonia
H_2SO_4 = Sulfuric Acid
Pb = Lead
HAP = Hazardous Air Pollutants
CO_2 = Carbon Dioxide
GHG = Greenhouse Gases
CO_{2e} = Greenhouse Gases expressed as Carbon Dioxide equivalent and calculated by multiplying each of the six greenhouse gases (Carbon Dioxide, Nitrous Oxide, methane, Hydrofluorocarbons, Perfluorocarbons, Sulfur Hexafluoride) mass amount of emissions, in tons per year, by the gas's associated global warming potential published at Table A-1 of 40 CFR Part 98, Subpart A and summing the six resultant values.
H_2S = Hydrogen Sulfide
ULSD = Ultra Low Sulfur Diesel Fuel Oil containing a maximum of 0.0015 weight percent sulfur
°F = degrees Fahrenheit
% = percent
MMBtu = million British thermal units
MMBtu/hr = million British thermal units per hour
HHV = higher heating value basis

VI. BACT Analysis

As required by the federal PSD program at 40 CFR 52.21(j)(2) and (3), the SHR Project is required to comply with BACT for the NO_x, CO, PM, PM_{10}, $PM_{2.5}$, H_2SO_4, and GHG emissions from the new turbines and other emission units.

BACT is defined as, "*an emissions limitation ... based on the maximum degree of reduction for each pollutant subject to regulation under [the Clean Air] Act which would be emitted from any proposed major stationary source or major modification which the Administrator, on a case-by-case basis, taking into account energy, environmental, and economic impacts and other costs, determines is achievable for such source or modification through application of production processes or available methods, systems and techniques … for control of such pollutant."* 40 CFR 52.21(b)(12); Clean Air Act (CAA) 169(3).

BACT determinations involve an evaluation process known as the "top-down" process. In brief, the "top-down" process involves a ranking of all available control technologies in descending order of control effectiveness. Applicants are required to first examine the most stringent ("top-case") alternative. MassDEP will presume this emission limit represents BACT unless the Applicant can demonstrate that it is not feasible for technical, energy, environmental or economic reasons. If the most stringent control alternative is eliminated, then the Applicant must consider the second best, and so on. This procedure is modeled after the EPA December 1987 Top Down BACT Policy. It was further described in the June 1991 NESCAUM BACT Guideline and October 1990 Draft EPA New Source Review Workshop Manual.

MassDEP has also developed "top-down" BACT guidance (June 2011) for various source categories including combustion turbine combined cycle units, boilers, and internal combustion engines. Footprint has used this guidance, in part, to propose BACT for the SHR Project.

The results of the BACT analyses for the proposed SHR Project are presented below for NO_x, CO, PM, PM_{10}, $PM_{2.5}$, H_2SO_4 mist, and GHG emissions.

Combined Cycle Combustion Turbines

Clean Fuels

For the combined cycle combustion turbines, a major element of the BACT analysis is the use of clean fuels. Footprint has proposed to burn solely natural gas in the combustion turbines. MassDEP agrees that natural gas is the cleanest-burning fossil fuel available, and therefore represents the most stringent "top" BACT with respect to the selection of turbine fuels.

NO_x

In addition to the requirement to apply PSD BACT for NO_x, the SHR Project is also subject to the determination of Lowest Achievable Emission Rate (LAER) because potential NO_x emissions from the SHR Project exceed the 310 CMR 7.00: Appendix A major source threshold of 50 tpy. Since determinations of LAER and BACT are similar, and LAER is more stringent than BACT, the control technology evaluation for NO_x reflects the requirements of both BACT and LAER.

LAER is defined in 310 CMR 7.00 as:

"the more stringent rate of emissions based on the following:

(a) The most stringent emissions limitation which is contained in any state SIP for such class or category of stationary source, unless the owner or operator of the proposed stationary source demonstrates that such limitations are not achievable; or

(b) The most stringent emissions limitation which is achieved in practice by such class or category of stationary source. This limitation, when applied to a modification, means the lowest achievable emissions rate for the new or modified emissions units within a stationary source.

In no event shall LAER allow a proposed new or modified stationary source to emit any pollutant in excess of the amount allowable pursuant to applicable new source standards of performance." (310 CMR 7.00: Appendix A(2) Definitions).

In order to identify the "most stringent emissions limitation which is achieved in practice" by an "F" Class combined cycle combustion turbine facility, Footprint evaluated numerous sources of information. These sources included both state and federal resources of publicly available air permitting information. California, New York, New Jersey, Connecticut, and Massachusetts were the focus for state specific determinations and guidance. Footprint evaluated the following sources of information to determine BACT (and LAER) for NO_x:

- EPA's RACT, BACT, LAER Clearinghouse (RBLC);

- MassDEP's BACT Guidance of June 2011 including Top Case BACT Guidelines for Combustion Sources;

- EPA Region IV's National Combustion Turbine List;

- The California Air Resources Board (CARB) BACT Clearinghouse;

- The California South Coast Air Quality Management District's (SCAQMD) BACT guidelines;

- State environmental program websites;

- New Jersey's State Of The Art (SOTA) Manual for Stationary Combustion Turbines; and

- The California Energy Commission Energy Facilities Siting Board.

In addition to these sources of information, additional publicly available information, such as permits for individual projects not listed in the RBLC or other sources, was also included in the analysis.

Footprint presented the following conclusions:

- A search of EPA's RBLC for the lowest NO_x emission rate for projects approved in the last 10 years for the EPA characterized "Process Type 15.210" (large gas-fired combined cycle combustion turbines) showed that the lowest approved NO_x rate in RBLC is 2.0 ppmvdc (parts per million by volume, dry basis, corrected to 15% O_2).

- The EPA Region IV National Combustion Turbine Spreadsheet, was examined to identify if any NO_x emission limits more stringent than 2.0 ppmvdc are reported. The only project identified with a NO_x emission limit less than 2.0 ppmvdc is the Sunlaw (CA) Cogeneration Project, which shows "1-2 ppm" for NO_x. However, the RBLC entry for Sunlaw (RBLC ID # CA-0863) confirms the emission level demonstrated in practice for this facility is 2.0 ppm.

- The CARB BACT Clearinghouse had nine records for combined cycle gas turbines greater than 50 MW; the only one more stringent than 2.0 ppmvdc NO_x was the IDC Bellingham Project (in MA), which is shown as having a NO_x limit of 1.5 ppmvdc. This entry contains a note indicating that the limit(s) "are as stringent or more stringent than prior existing SCAQMD BACT for this source category. These limits have not been verified by performance data. These limits were negotiated with the Applicant and are presumably based on vendor guarantees." The IDC Bellingham Project was never built, so the approved NO_x level of 1.5 ppm was never demonstrated in practice. Therefore, IDC Bellingham is not a precedent for NO_x BACT (or LAER).

- The SCAQMD BACT Clearinghouse has three gas turbine combined-cycle units listed, with two approved at 2.0 ppmvdc and one approved at 2.5 ppmvdc.

- New Jersey's SOTA Manual for combustion turbines specifies a NO_x limit of 2.5 ppmvdc for combustion turbine combined cycle units greater than 150 MMBtu/hr heat input.

- The June 2011 MassDEP BACT guidance for combustion sources identifies 2.0 ppmvdc of NO_x as the "top case" BACT for large gas-fired combined cycle units.

- The two most recent NO_x LAER precedents for similar Massachusetts projects are also 2.0 ppmvdc for gas firing. These are for the Brockton Power Company LLC (Plan Approval No. 4B08015, July 20, 2011) and Pioneer Valley Energy Center (EPA Final PSD Permit No. 052-042-MA15), April 2012).

In summary, Footprint did not identify any BACT (or LAER) precedents for large gas-fired combined cycle turbines where a NO_x emission limit of less than 2.0 ppmvdc has been approved and subsequently demonstrated in practice. Based on this review, MassDEP has determined that 2.0 ppmvdc represents the "top case" BACT for NO_x (as well as LAER) for the SHR Project's proposed combustion turbines.

Footprint has proposed to achieve the NO_x emission limit of 2.0 ppmvdc by using state of the art dry low-NO_x (DLN) combustors in combination with selective catalytic reduction (SCR). DLN combustors are designed to minimize the creation of NO_x in the turbine's combustion chamber. SCR reduces NO_x to nitrogen (N_2) and water (H_2O) in the presence of a catalyst and ammonia.

SCR is placed in the exhaust flue of the combustion turbine. An SCR system is composed of an ammonia storage tank, ammonia (NH_3) forwarding pumps and controls, an injection grid (a system of nozzles that spray NH_3 into the exhaust gas ductwork), a catalyst reactor, and instrumentation and controls. The injection grid disperses NH_3 in the flue gas upstream of the catalyst, and NH_3 and NO_x are reduced to N_2 and H_2O in the catalyst reactor.

Several different types of catalysts can be used to accommodate a wide range of flue gas temperatures. Base metal catalysts, typically containing vanadium and/or titanium oxides, are typically used for flue gas exhausts ranging between 450°F and 800°F. Combined cycle combustion turbine projects employ a HRSG to produce steam from the hot exhaust gases exiting the turbine in order to generate additional electricity in a steam turbine. As a result, combined cycle projects proponents can design the HRSG such that a base metal SCR catalyst can be placed within the HRSG under its optimum temperature window to maximize NO_x reduction.

Because Footprint is proposing the "top case" NO_x emission rate, it was not required to conduct a "top-down" BACT analysis identifying other potential control technologies. Based on the results of Footprint's NO_x BACT (and LAER) evaluation research, MassDEP accepts Footprint's conclusion that only SCR has been successfully demonstrated in practice to achieve the low NO_x emission rate that currently represents BACT (and LAER) for large combustion turbines (100 MW or greater), and that SCR (in combination with DLN combusters) therefore will deliver BACT for NOx for the SHR Project.

CO

Carbon monoxide (CO) is emitted from combustion turbines as a result of incomplete oxidation of the fuel. CO emissions can be minimized by the use of proper combustor design and good combustion practices. Footprint is proposing to include catalytic oxidation systems for the SHR Project, which Footprint has stated is the most stringent available CO control technology. A catalytic oxidation system can provide 90% nominal reduction in CO emissions. The oxidation catalyst is a passive reactor that consists of a honeycomb grid of metal panels coated with a platinum catalyst. The catalyst grid is placed in the HRSG in the turbine exhaust gas. Footprint proposes that the SHR Project will achieve CO emissions of 2.0 ppmvdc, which matches the top level of control for CO emissions as specified in the June 2011 MassDEP Top Case BACT Guidelines for combustion turbine combined cycle units firing natural gas.

The two most recent CO BACT precedents for similar Massachusetts projects are also 2.0 ppmvdc for natural gas firing. These are for the Brockton Power Company LLC (Plan Approval No. 4B08015, July 20, 2011) and Pioneer Valley Energy Center (EPA Final PSD Permit No. 052-042-MA15, April 2012).

Therefore, MassDEP concludes that Footprint has proposed the "top-case" BACT for CO for the combustion turbine combined cycle units, which is 2.0 ppmvdc.

$PM/PM_{10}/PM_{2.5}$

Emissions of particulate matter result from trace quantities of ash (non-combustibles) in the fuel as well as products of incomplete combustion. Footprint has proposed to minimize particulate emissions from the proposed SHR Project by utilizing state of the art combustion turbines firing solely natural gas, since natural gas is the lowest ash-content fuel available. Footprint conservatively presumes that all particulate matter (PM) emissions from combustion turbines firing natural gas are less than 2.5 microns in diameter ($PM_{2.5}$), and therefore is proposing to achieve emissions of PM, PM_{10}, and $PM_{2.5}$, of 0.0067 pounds per million British thermal units (lb/MMBtu) at 100% combustion turbine (CT) load, 0.0071 lb/MMBtu at 75% CT load, and 0.0088 lb/MMBtu at the minimum emissions compliant CT load. These proposed rates are lower than the June 2011 MassDEP Top Case BACT level of 0.011 lb/MMBtu.

The two most recent $PM/PM_{10}/PM_{2.5}$ BACT precedents for similar Massachusetts projects have also been evaluated. The Brockton Power Company LLC (Plan Approval No. 4B08015, July 20, 2011) was approved for 0.007 lb/MMBtu for loads down to 60% load. MassDEP concludes that the PM BACT for Brockton and the SHR Project are comparable for SHR CT loads at 75% and greater. Footprint has indicated that the turbine vendor performance levels at minimum emissions compliant CT load require a slightly higher lb/MMBtu PM limit. MassDEP has evaluated this request and concludes that the operating flexibility afforded by operating at the minimum load levels warrants the approval of a PM rate of 0.0088 lb/MMBtu at the minimum load conditions.

Pioneer Valley Energy Center (PVEC) (EPA Final PSD Permit No. 052-042-MA15, April 2012) was approved for a $PM/PM_{10}/PM_{2.5}$ emission rate of 0.004 lb/MMBtu for natural gas firing. Footprint contends that this rate does not represent BACT since it was not demonstrated in practice since the PVEC Project has not yet been constructed, and that it is not consistent with recent test data for the same

model turbine. Footprint contends that the MassDEP "top case" BACT precedent identified in the June 2011 BACT Guidance is for the Mystic Station Plan Approval which was approved for 0.011 lb/MMBtu, and that the four Mystic Station MHI 501G units had tested PM emissions ranging from 0.005 to 0.010 lb/MMBtu. Footprint contends that the majority of the tested particulate matter was condensable particulates at Mystic.

Footprint further contends that the PVEC is also based on the MHI 501G turbine, and since the majority of the tested particulate matter was condensable particulates for Mystic, it is not reasonable to expect that the MHI 501G unit at PVEC could reliably achieve 0.004 lb/MMBtu in practice.

MassDEP has determined that the Footprint position regarding the PVEC emission limit of 0.004 lb/MMBtu has merit and concludes that the PM emission rate of 0.0088 lb/MMBtu represents BACT for $PM/PM_{10}/PM_{2.5}$ for the SHR Project's combined cycle turbines.

Sulfuric Acid Mist (H_2SO_4)

Emissions of sulfuric acid mist (H_2SO_4) are generated by the oxidation of sulfur in the fuel. The only means for controlling sulfuric acid mist emissions from the SHR Project is to limit the sulfur content of the fuel. Thus, by using solely natural gas which has a very low fuel sulfur content, H_2SO_4 emissions are minimized. The SHR Project is proposing an H_2SO_4 emission limit of 0.0010 lb/MMBtu, which is lower than the Top Case BACT rate of 0.0016 lb/MMBtu in the June 2011 MassDEP BACT guidance.

The most recent H_2SO_4 BACT precedent for a similar Massachusetts project has also been evaluated. The Pioneer Valley Energy Center (EPA Final PSD Permit No. 052-042-MA15, April 2012) was approved with an H_2SO_4 BACT limit for natural gas firing of 0.0019 lb/MMBtu. The Brockton Power Company LLC Project (Plan Approval No. 4B08015, July 20, 2011) did not include an H_2SO_4 BACT limit.

MassDEP therefore concludes that Footprint's proposed H_2SO_4 emission limit of 0.0010 lb/MMBtu is BACT for H_2SO_4 for the SHR Project's combined cycle turbines.

Greenhouse Gas Emissions (GHG)

Greenhouse gas emissions for PSD permitting from combustion sources are the aggregate of three pollutants: carbon dioxide, methane, and nitrous oxide. Since each pollutant has a different effect on global warming, PSD applicability is based on a carbon dioxide equivalent (CO_{2e}), determined by multiplying each pollutant by its global warming potential. Like other combustion sources, the main constituent of GHG for a combined cycle turbine is carbon dioxide. For Footprint's proposed combined cycle turbines, their carbon dioxide emissions constitute 99.9% of their GHG emissions on a CO_{2e} basis. Nitrous oxide and methane make up the other 0.1% of the GHG emissions from these combined cycle turbines on a CO_{2e} basis.

The most stringent control technology for control of GHG from a combustion turbine combined cycle unit is by means of carbon capture and storage (CCS). Footprint evaluated the feasibility of CCS based on material published by EPA. CCS is composed of three main components. The first component

is the capture or removal of carbon (i.e., CO_2) from the exhaust gas. The second component is transport of the captured CO_2 to a suitable disposal site, and the third component is the actual disposal of CO_2, normally deep underground in geological formations. Current technologies could be used to capture CO_2 from new and existing fossil energy power plants; however, they are not ready for widespread implementation primarily because they have not been demonstrated at the scale necessary to establish confidence for power plant applications.

Footprint indicated for pipeline transport for captured carbon, there are no nearby existing CO_2 pipelines. The nearest CO_2 pipelines to Massachusetts are in northern Michigan and southern Mississippi. With regard to storage for CCS, EPA, in an Interagency Task Force Report ("Report of the Interagency Task Force on Carbon Capture and Storage," August 2010), concludes that while there is currently estimated to be a large volume of potential storage sites, "to enable widespread, safe, and effective CCS, CO_2 storage should continue to be field-demonstrated for a variety of geologic reservoir classes" and that "scale-up from a limited number of demonstration projects to widescale commercial deployment may necessitate the consideration of basin-scale factors (e.g., brine displacement, overlap of pressure fronts, spatial variation in depositional environments, etc.)".

Based on conclusions of the Interagency Task Force for the CO_2 capture component alone (setting aside a detailed evaluation of the technical and economic feasibility of right-of-ways to build a pipeline or of storage sites), Footprint contends that CCS has been determined to not currently be technically feasible for projects of the size of the SHR Project. MassDEP concurs with this conclusion.

Since Footprint has demonstrated that it will be using the lowest carbon emitting fuel for a fossil fuel project, Footprint further states that GHG BACT is then met by efficient generation of power by means of combustion turbine combined cycle technology. Footprint's proposed GHG BACT is an initial design limit of 825 pounds CO_{2e} per net Megawatt hour of power delivered to the grid (lb $CO_{2e}/MWhr_{grid}$). Footprint proposes to demonstrate compliance with this value by means of an initial performance test, to be conducted within 180 days of facility startup. This test will be done at CT full (base) 100% load, without duct firing, with the test results corrected to turbine ISO conditions.

Footprint also proposes to meet a 365-day rolling average GHG limit of 895 lb $CO_{2e}/MWhr_{grid}$, for the life of the facility.

Footprint has proposed these limits which are identical to the approved GHG BACT limits for the Pioneer Valley Energy Center (PVEC, EPA Final PSD Permit No. 052-042-MA15, April 2012). This 365 day rolling average limit accounts for operation at varying loads, startup and shutdown, varying temperatures, and in particular unavoidable performance degradation between major overhauls and over the life of the facility.

Footprint also notes that the PVEC Project used a CO_{2e} emission factor of 116 lb/MMBtu. The SHR Project CO_{2e} emission factor is 119 lb/MMBtu, of which CO_2 emissions comprise 118.9 lb/MMBtu and the other GHG comprise 0.1 lb/MMBtu. Footprint claims this makes its proposal to meet the same limits as PVEC actually 2.6% more stringent than PVEC's approved limits.

In addition to the PVEC Project, the other recent GHG BACT precedent for a similar project in Massachusetts is the Brockton Power Company LLC Project (Plan Approval No. 4B08015, July 20,

2011). The Brockton Project was approved for a rolling 12-month CO_2 limit of 842 lb/MWhr. The basis for the 842 lb/MWhr CO_2 limit in the Plan Application for the Brockton Project is stated "to include operation at a variety of loads, ambient temperatures, with and without evaporative cooling, and with and without duct firing, and including starts and stops" (Brockton Power Plan Application at page 4-30). However, there is no mention of any allowance for heat rate (efficiency) degradation over the life of the project or between major turbine overhauls. Footprint contends that this is a significant consideration which renders this value of 842 lb CO_2/MWhr as inappropriate as a GHG BACT precedent. Footprint notes that the Brockton Project has not yet been constructed, and the 842 lb CO_2/MWhr value therefore has not been demonstrated in practice. In addition, Footprint notes that the Brockton Project did not specifically undergo a PSD review for GHG BACT.

Footprint also notes that in the Plan Application for the Brockton Project, it is stated that the 842 lb CO_2/MWhr value is based on a CO_2 emission factor of 117 lb/MMBtu. Footprint notes its proposed limit of 895 lb CO_{2e}/$MWhr_{grid}$ is based on a CO_{2e} emission factor of 119 lb/MMBtu. Adjusting the Brockton value of 842 lb CO_2/MWhr by 118.9/117, the Brockton rate based on 118.9 lb CO_2/MMBtu would be 856 lb CO_2/MWhr. In this case, the SHR Project value (895 lb CO_{2e}/$MWhr_{grid}$) is only 4.6% higher than the adjusted Brockton value (856 lb CO_2/MWhr). In addition, the Brockton Project design is based on wet cooling, while the SHR Project will use dry cooling. Projects using dry cooling have higher heat rates (are less efficient) than wet cooled projects, particularly during the summer months. Reasonable allowance for heat rate (efficiency) degradation over the life of the project and between major turbine overhauls, as well as the impact of wet vs. dry cooling, explains the proposed GHG BACT for the SHR Project of 895 lb CO_{2e}/$MWhr_{grid}$ compared to the proposed Brockton limit.

MassDEP concludes that the 365 day rolling average GHG emissions of 895 lb CO_{2e}/$MWhr_{grid}$, which includes a reasonable allowance for the various factors affecting long-term GHG emissions, including performance degradation, represents BACT for GHG emissions. Therefore the SHR Project proposed GHG BACT limits of 825 lb CO_{2e}/$MWhr_{grid}$ (initial design limit) and the 895 lb CO_{2e}/$MWhr_{grid}$ (365 day rolling average) are approved as BACT for GHG.

Startup and Shutdown Emissions

Combustion turbines experience increased NO_x, CO, H_2SO_4, and PM emissions during startup and shutdown due to the non-steady state operations. In addition, low operating temperatures during these conditions preclude the use of the SCR to reduce NO_x. Footprint has proposed to comply with BACT for startup and shutdown by employing good operating practices (by following the manufacturer's recommendations during startup), and by limiting startup time. The combustion turbines will be operated in accordance with manufacturer specifications during startups and shutdowns in order to ensure that emissions are minimized during these short time periods. Additionally, ammonia injection will be initiated as soon as the SCR catalyst reaches its vendor-specified minimum operating temperature and all system parameters are met to minimize NO_x emissions during these periods. The proposed startup and shutdown emission limits are presented in Table 3.

MassDEP agrees that these emission rates represent BACT during startup and shutdown periods. The emission limits for pollutants other than NO_x, CO, H_2SO_4, and PM will apply at all times, including during startup and shutdown.

Table 3. Startup and Shutdown Emission Limits (lbs per event)		
Pollutant	**Startup (duration 45 minutes)**	**Shutdown (duration 27 minutes)**
NO_x	89	10
CO	285	151
$PM/PM_{10}/PM_{2.5}$	23	29
H_2SO_4	1.3	0.2

Auxiliary Boiler

The proposed SHR Project will include the installation of an 80 MMBtu/hr heat input, natural gas-fired auxiliary boiler. Annual operation of the auxiliary boiler will be limited to the full load equivalent of 6,570 hours per year. The unit will be equipped with ultra-low NO_x burners for NO_x control. Emissions will be controlled through the exclusive use of natural gas as fuel, good combustion practices and a limit on the annual operations. In addition, the auxiliary boiler will meet the emission limits determined by MassDEP to be the Top Case BACT for natural gas-fired boilers between 40 MMBtu and 100 MMBtu/hr in size (June 2011) with the exception of $PM/PM_{10}/PM_{2.5}$ emissions. The top BACT case listed in the June 2011 MassDEP Guidance for natural gas-fired boilers of this size is 0.002 lb/MMBtu which Footprint contends is not feasible as BACT for this Application. For $PM/PM_{10}/PM_{2.5}$ emissions, Footprint is proposing a BACT limit of 0.005 lb/MMBtu. Footprint contends this BACT limit is more stringent than other recent BACT limits for natural gas-fired boilers in Massachusetts. PM BACT limits, established relatively recently, were 0.007 lb/MMBtu for auxiliary boilers at Mystic Station and Veolia MATEP, and 0.01 lb/MMBtu for Brockton Power. The PM BACT limit for the auxiliary boiler at Pioneer Valley Energy Center is comparable at 0.0048 lb/MMBtu.

MassDEP concurs with Footprint's assessment of auxiliary boiler PM BACT. MassDEP also finds that the auxiliary boiler NO_x limit of 0.011 lb/MMBtu represents BACT for NO_x.

The approved BACT emission limits for the auxiliary boiler are shown in Table 4.

Table 4. BACT Emission Limits for the Auxiliary Boiler			
Pollutant	**Emission Limitation**	**BACT Determination**	**Control Technology**
NOx	0.011 lb/MMBtu	MassDEP Top Case BACT Guidelines for Natural Gas Boilers (40-100 MMBtu/hr heat input) (June 2011)	- Ultra Low NOx Burners (9 ppm) - Good combustion practices - Natural gas
$PM/PM_{10}/PM_{2.5}$ [1]	0.005 lb/MMBtu		
CO	0.035 lb/MMBtu		
H_2SO_4 [2]	0.0010 lb/MMBtu		Natural Gas

1. PM BACT for natural gas-fired boilers between 40 and 100 MMBtu/hr in the MassDEP guidance (June 2011) is 0.002 lb/MMBtu. Footprint is proposing a $PM/PM_{10}/PM_{2.5}$ emission limit of 0.005 lb/MMBtu which is comparable or less than MassDEP values recently approved for new gas-fired boilers.

2. Mystic Station auxiliary boiler SO_2 emission limit is 0.0023 lb/MMBtu. Based on the natural gas sulfur content restriction of 0.5 grains per 100 ft^3, the proposed SO_2 emission limit is 0.0015 lb/MMBtu. H_2SO_4 emissions assumed to be equivalent to approximately 2/3 of SO_2 emissions based on vendor data. No H_2SO_4 emission limit cited in Mystic Station Plan Approval.

Emergency Generator and Fire Pump Engines

The SHR Project will include an emergency diesel generator (EDG) engine and a diesel fire pump (FP). Both engines will operate on ULSD fuel. The proposed EDG will be a Cummins 750DQFAA ULSD-fired engine (or equivalent) with a standby generating capacity of 750 kW. The FP engine will be a 371 BHP, 2.7 MMBtu/hr ULSD-fired engine. Both engines will be used in emergency situations only (with the exception of periodic maintenance/testing events) and will be limited to a maximum of 300 hours per rolling 12-month period of operation. There are no post-combustion controls that have been demonstrated in practice for small, emergency internal combustion engines. In order to satisfy BACT requirements, Footprint has proposed that the EDG will meet the EPA Tier 2 standards and that the FP will meet EPA Tier 3 standards for off-road diesel engines. These both meet requirements specified under 40 CFR Part 89 as is specified in MassDEP's Air Pollution Control Regulation at 310 CMR 7.26(42)(b) and represent the Top Case under MassDEP's June 2011 BACT Guidelines. Emissions will be controlled through the use of ULSD, good combustion practices and limited annual operation. With the exception of emergency situations, the units will typically operate no more than one hour per week, for testing and maintenance purposes. The specific EDG and FP BACT emission limits are shown in Tables 5 and 6.

Table 5. EDG BACT Emission Limits			
Pollutant	**EPA Tier 2 Standard**	**Emissions (lbs/hr)**	**Emissions (tpy)**
NO_x [1]	6.4 g/kWh	11.60	1.7
CO	3.5 g/kWh	6.34	1.0
$PM/PM_{10}/PM_{2.5}$	0.2 g/kWh	0.42 [2]	0.06 [2]
H_2SO_4 [3]	-	0.0009	0.00013

1. EPA Tier 2 standard for NO_x and VOC is 6.4 g/kWh, combined. For worst case potential emissions, NO_x emissions assumed equal to this level and VOC emissions assumed equal to the older EPA Tier 1 limit of 1.3 g/kWh.

2. Emission limit reflects the addition of approximately 0.032 g/kWh for condensable particulate to the EPA Tier 2 standard based on AP-42 ratios.

3. There is no Tier 2 limit for SO_2 emissions. SO_2 emissions are limited based upon ULSD fuel sulfur content of 0.0015 weight percent. H_2SO_4 emissions assumed equal to 8 weight percent of SO_2 emissions.

Table 5 Key:

g/kWh = grams per Kilowatt-hour
lb/hr = pounds per hour
tpy = tons per year

Table 6. FP BACT Emission Limits			
Pollutant	**EPA Tier 3 Standard**	**Emissions (lbs/hr)**	**Emissions (tpy)**
NO_x [1]	4.0 g/kWh	2.44	0.4
CO	3.5 g/kWh	2.14	0.3
$PM/PM_{10}/PM_{2.5}$	0.2 g/kWh	0.14 [2]	0.02 [2]
H_2SO_4 [3]	-	0.0003	0.00005

1. EPA Tier 3 standard for NO_x and VOC is 4.0 g/KWh, combined. For worst case potential emissions, NO_x emissions assumed equal to this level and VOC emissions assumed equal to the older EPA Tier 1 limit of 1.3 g/kWh.

2. Emission limit reflects the addition of approximately 0.032 g/kWh for condensable particulate to the EPA Tier 3 standard based on AP-42 ratios.

3. There is no Tier 3 limit for SO_2 emissions. SO_2 emissions are limited based upon ULSD fuel sulfur content of 0.0015 weight percent. H_2SO_4 emissions assumed equal to 8 weight percent of SO_2 emissions.

Table 6 Key:

g/kWh = grams per Kilowatt-hour
lb/hr = pounds per hour
tpy = tons per year

VII. Monitoring and Testing

Footprint will install, calibrate, and operate dedicated continuous emission monitoring systems for measuring NO_x and CO emissions, in addition to the diluent oxygen (O_2), in the flue gas from the combined cycle turbines. Each system will consist of a probe, analyzer, and data acquisition and handling system. The NO_x monitoring system shall meet the specifications and quality assurance procedures of 40 CFR Part 75. The CO and O_2 monitoring systems shall meet the specifications and quality assurance procedures of 40 CFR Part 60 Appendix B, Performance Specifications 4 and 4A (for CO) and Performance Specification 3 for O_2. Emission data for CO and NO_x will be measured by the analyzer in ppmvd (parts per million by volume, dry basis). This ppmvd data can be directly compared to the permit emission limits to determine compliance.

Pursuant to 40 CFR 75.13, Footprint will also monitor CO_2 emissions in accordance with 40 CFR Part 75, Appendix G. To obtain NO_x and CO mass emissions on an hourly basis, Footprint will use EPA methods contained in 40 CFR Part 75 for NO_x and 40 CFR Part 60, Appendix A, Method 19 for CO. Footprint will need to measure heat input on an hourly basis and moisture content to convert the measured ppmvd data to pounds per hour (lbs/hr).

Footprint is required to monitor and keep records of the amount of sulfur in the natural gas that is combusted in the combined cycle turbines.

Footprint is also required to conduct stack tests for CO, NO_x, PM, PM_{10}, $PM_{2.5}$, CO_2, and H_2SO_4 emissions within 180 days after initial firing of the combined cycle turbines.

VIII. Impact Analysis Based on Modeling

As part of its Application, Footprint submitted a dispersion modeling analysis that met the requirements of 40 CFR Part 51, Appendix W.

Footprint's consultant (Tetra Tech) conducted a refined dispersion modeling analysis to determine impact concentrations at receptors located along the SHR Project fence line and beyond. The refined analysis was based on proposed, worst case facility emission rates, and 5 years (2006-2010) of

meteorological conditions. The meteorological data was collected at the Boston Logan Airport National Weather Service (NWS) station, which is the nearest NWS station to the project and is representative of the project site area since it is exposed to similar coastal environmental conditions.

The dispersion modeling results for the proposed SHR Project are provided in Table 7 and show that the SHR Project's impact concentrations are below the corresponding Significant Impact Levels (SILs) established by EPA for all pollutants except NO_2 (1-hour) and $PM_{2.5}$ (24-hour). Compliance with the NAAQS and PSD Increments is therefore, according to EPA guidance, demonstrated for all pollutants and averaging periods for which impacts are below the SILs. Cumulative modeling with other regional sources was conducted for NO_2 and $PM_{2.5}$.

Table 7. Project Maximum Predicted Impact Concentrations Compared to Significant Impact Levels (micrograms/cubic meter)

Pollutant	Averaging Period	Maximum Predicted Salem Harbor Redevelopment Project Impact	SIL
PM_{10}	24-Hour	4.3	5
$PM_{2.5}$	24-Hour	3.2	1.2
	Annual	0.12	0.3
NO_2	1-Hour	41.8	7.5
	Annual	0.4	1
SO_2	1-Hour	1.0	7.8
	3-Hour	1.1	25
	24-Hour	0.7	5
	Annual	0.03	1
CO	1-Hour	313.6	2000
	8-Hour	112.4	500

Background Concentrations and Nearby Sources

Tetra Tech determined ambient background concentrations through the use of existing ambient monitoring data representative of the SHR Project site area. Ambient background concentrations are based on the measurements made at the MassDEP monitoring site (ID# 025-009-2006) located in Lynn, MA. The Lynn monitoring site is located approximately 5.9 miles to the southwest of the project site. This monitoring site is representative of the SHR Project site since it is located relatively close to the site. Furthermore, use of data from the Lynn monitoring site is also conservative because Lynn is a more industrialized and densely populated area than the proposed SHR Project site area, particularly without the influence of the coal and residual oil fired existing Salem Harbor Station, as will be the situation when the SHR Project begins operations. The SHR Project site is located adjacent to Salem Harbor, a significantly large water body where potential emission sources are more limited. The Lynn monitoring site is also located closer to the metropolitan Boston area than the project site area. Any potentially elevated ambient background pollutant concentrations from mobile and stationary emission sources located in and around the Boston metro area that may be transported to the Salem project area (via predominant south-southwesterly winds, i.e. winds blowing towards the north-northeast), must pass the Lynn monitoring site, and are therefore represented in the measurement data collected at the Lynn monitoring site.

The GE Aircraft Engine facility in Lynn and the Wheelabrator Saugus waste-to-energy facility, two major industrial emission sources modeled cumulatively with the proposed SHR Project, are located slightly less than 2 miles from the monitoring site but are located about 7 miles from the SHR Project site. Therefore, the cumulative modeling compliance demonstration, which includes both the background ambient concentrations and impacts from the interactive existing major sources potentially double counts the contribution of these sources and therefore, potentially overestimates cumulative impact concentrations. This is particularly significant because these two major sources are located to the south-southwest of the monitoring site which means that they could potentially influence the monitoring site concentrations during south-southwesterly winds (winds blowing towards the north northeast) which is one of the predominant wind directions in the area.

Nearby sources that must be considered in cumulative modeling are described in 40 CFR Part 51, Appendix W as follows:

> *"Nearby Sources:* All sources expected to cause a significant concentrations gradient in the vicinity of the source or sources under consideration for emission limit(s) should be explicitly modeled. The number of expected sources is expected to be small except in unusual situations. Owing to both the uniqueness of each modeling situation and the large number of variables involved in identifying nearby sources, no attempt here is made to define the term. Rather, identification of nearby sources calls for the exercise of professional judgment by the appropriate reviewing authority (paragraph 3.0(b)). This guidance is not intended to alter the exercise of the judgment or to comprehensively define which sources are nearby sources."

The term "sources" in EPA's modeling guidance refers to stationary point sources of air emissions. Air emissions from mobile sources are addressed through the use of ambient background concentrations as measured by representative monitors. MassDEP reviewed recent emissions source inventory data for point sources of NO_x and $PM_{2.5}$ surrounding the project. In accordance with MassDEP's June 2011 "Modeling Guidance for Significant Stationary Sources of Air Pollution", nearby sources within 10 kilometers that emit significant emission rates for NO_x and $PM_{2.5}$ (40 tons per year and 10 tons per year actual emissions, respectively) may significantly interact with a new or modified facility.

The sources that were identified for inclusion in the source interaction cumulative modeling analysis include the General Electric (GE) Lynn, MA and Wheelabrator Saugus, MA facilities for both NO_x and $PM_{2.5}$ emissions, as well as the Rousselot (formerly Eastman Gelatin Corp.), Peabody Municipal Light (PML), and Marblehead Municipal Light (MML) facilities, for NO_x emissions only. The GE and Wheelabrator facilities are located approximately 7.5 and 7.2 miles, respectively, to the southwest of the project site. Based on the 2008 MassDEP emission source inventory data, actual GE emission levels for NO_x and $PM_{2.5}$ are 248.3 and 11.8 tons per year, respectively. Wheelabrator emission levels for NO_x and $PM_{2.5}$ are 721.8 and 6.2 tons per year, respectively. The Rousselot, PML, and MML facilities are located approximately 3.1 miles to the east, 2.8 miles to the northeast, and 1.3 miles to the southeast of the project site, respectively. The actual 2008 NO_x emission levels for these facilities are 15.0 tons per year (Rousselot), 6.4 tons per year (PML), and 0.34 tons per year (MML). The actual NO_x emissions from these three sources are below the PSD significance level of 40 tons per year of NO_x, but were included in the analysis because of their proximity to the proposed SHR Project.

The results of the cumulative impact assessment, presented in Table 8, demonstrate that the proposed SHR Project's worst case emissions will result in compliance with the National Ambient Air Quality Standards (NAAQS). Note that while impacts related to secondary $PM_{2.5}$ emissions have not been explicitly quantified, sufficient margin is available between the predicted impact concentrations from direct $PM_{2.5}$ emissions and the NAAQS, that the NAAQS would not be threatened by additional $PM_{2.5}$ emissions. This conclusion is further supported by the fact that the maximum $PM_{2.5}$ impacts are predicted very close to the facility fence line, where secondary $PM_{2.5}$ emissions would not have sufficient time to develop, and therefore, could only be additive to predicted project impacts where impacts of direct $PM_{2.5}$ emissions are less than what has been reported for the compliance demonstration.

Table 8. Salem Harbor Station Redevelopment Project NAAQS Compliance Assessment (micrograms/cubic meter)

Pollutant	Averaging Period	Cumulative Impact, SHR Project Plus Existing Sources [2]	Background [1]	Total Impact Plus Background	Primary NAAQS
$PM_{2.5}$	24-Hour	3.5	18.9	22.4	35
NO_2	1-Hour	83.7 [3]	82.3	166.0	188

1. Background concentrations are based on the measured values from 2010 through 2012. Short term background concentrations for 24-Hour $PM_{2.5}$ and 1-Hour NO_2, are the average of the 98th percentile values over the 3 years (2010-2012). These assumptions are consistent with the form of the NAAQS for the pollutant.

2. Consistent with EPA modeling guidance for NAAQS compliance assessments, impact concentrations are based on the 5 year average of the 1st highest values occurring in each year for the 24-Hour $PM_{2.5}$ concentration, and the 5 year average of the 8th highest daily maximum concentrations occurring in each year for the 1-Hour NO_2 concentration.

3. The modeled cumulative impacts represent an EPA-approved Tier 2 approach reflecting an 80 percent conversion of NO_x emissions to NO_2 in the ambient air.

In addition to demonstrating compliance with the NAAQS, Footprint is required to demonstrate that its emission impacts will not exceed available PSD increments. No increment exists for 1-hour NO_2. On October 20, 2010, EPA published an increment standard for $PM_{2.5}$, averaged over both annual and 24-hour basis. In this rulemaking, EPA established the major source baseline date of October 20, 2010 and a requirement that all PSD $PM_{2.5}$ sources will not consume more than the available increment. For $PM_{2.5}$, increment is tracked on a county wide basis in Massachusetts. The SHR Project will be the first major source permitted in Essex County after this date, and therefore the entire increments of 9 $\mu g/m^3$ (24-Hour $PM_{2.5}$) and 4 $\mu g/m^3$ (Annual $PM_{2.5}$) are available. As shown in Table 9, the SHR 24-hour $PM_{2.5}$ and Annual $PM_{2.5}$ impacts are 35.5% and 3% of their respective PSD increments.

Table 9. Salem Harbor Station Redevelopment Project PSD Increment Compliance Assessment (micrograms/cubic meter)

Pollutant	Averaging Period	SHR Project Increment Consumption[1]	Maximum Allowable PSD Increment
$PM_{2.5}$	24-Hour	3.2	9

Table 9. Salem Harbor Station Redevelopment Project PSD Increment Compliance Assessment (micrograms/cubic meter)			
Pollutant	**Averaging Period**	**SHR Project Increment Consumption[1]**	**Maximum Allowable PSD Increment**
$PM_{2.5}$	Annual	0.12	4

1. Consistent with EPA modeling guidance for PSD increment compliance assessments, impact concentrations are based on the 5-year average of the 1st highest values occurring in each year for 24-hour and annual $PM_{2.5}$ concentrations.

Impairment to Visibility, Soils, and Vegetation

40 CFR 52.21(o) requires the Applicant to conduct an analysis of the air quality impact and impairment to visibility, soils, and vegetation that would occur as a result of the SHR project and general commercial, residential, industrial, and other growth associated with the project. The VISCREEN model was used by Tetra Tech to assess potential visibility impacts at the closest Class I Area, the Presidential Range/Dry River National Wilderness Area (185 km away). The SHR Project's maximum potential emissions were used in the analysis. MassDEP reviewed the analysis and has determined that the visibility impairment related to the SHR Project's plume will not exceed threshold criteria.

The EPA guidance document for soils and vegetation, "A Screening Procedure for the Impacts of Air Pollution Sources on Plants, Soils, and Animals" (EPA Screening Procedure) (EPA 450/2-81-078) established a screening methodology for comparing air quality modeling impacts to "vegetation sensitivity thresholds." As an indication of whether emissions from the SHR Project will significantly impact the surrounding vegetation (i.e., cause acute or chronic exposure to each evaluated pollutant), the modeled emission concentrations have been compared against both a range of injury thresholds found in the guidance, as well as those established by the NAAQS secondary standards. Since the NAAQS secondary standards were set to protect public welfare, including protection against damage to crops and vegetation, comparing modeled emissions to these standards provides some indication of whether potential impacts are likely to be significant. Table 10 lists the project impact concentrations and compares them to the vegetation sensitivity thresholds and NAAQS secondary standards. All pollutant impact concentrations are below the vegetation sensitivity thresholds.

Table 10. Vegetation Impact Screening Thresholds				
Pollutants	**Averaging Period**	**Maximum Project Impacts ($\mu g/m^3$)**	**Secondary NAAQS ($\mu g/m^3$)**	**EPA's 1980 Screening Concentrations ($\mu g/m^3$)**
SO_2	1-hour	1.1	NA	917
	3-hour	1.2	1300	786
	Annual	0.03	NA	18
NO_2	4-hour	41.8 [1]	NA	3760
	1 month	41.8 [1]	NA	561
	Annual	0.4	100	94
CO	Week	112.4 [1]	NA	1,800,000 (weekly)

Table 10. Vegetation Impact Screening Thresholds				
Pollutants	**Averaging Period**	**Maximum Project Impacts ($\mu g/m^3$)**	**Secondary NAAQS ($\mu g/m^3$)**	**EPA's 1980 Screening Concentrations ($\mu g/m^3$)**
PM_{10}	24-hour	4.3	150	None
$PM_{2.5}$	24-hour	3.2	35	None
	Annual	0.12	15	

1. Conservatively based on shorter term average predicted concentration.

The EPA Screening Procedure also provides a method for assessing impacts to soils. This assessment evaluates trace elements contamination of soils. Since plant and animal communities can be affected before noticeable accumulations occur in the soils, the approach used here evaluates the way soil acts as an intermediary in the transfer of a deposited trace element to the plants. For trace elements, the concentration deposited in the soil is calculated from the maximum predicted annual ground level concentrations conservatively assuming that all deposited material is soluble and available for uptake by plants. The amount of trace element potentially taken up by plants was calculated using average plant to soil concentration ratios. The calculated soil and plant concentrations were then compared to screening concentrations designed to assess potential adverse effects to soils and plants. Table 11 presents the results of the potential soil and plant concentrations based on Tetra Tech's analysis and compares them to the corresponding screening concentration criteria. A calculated concentration in excess of either of the screening concentration criteria is an indication that a more detailed evaluation may be required. MassDEP reviewed the analysis and has determined that concentrations as a result of operation of the proposed SHR Project are all well below the screening criteria.

Table 11. Soils Impact Screening Assessment						
Pollutant	**Deposited Soil Concentration (ppmw)**	**Soil Screening Criteria (ppmw)**	**Percent of Soil Screening Criteria**	**Plant Tissue Concentration (ppmw)**	**Plant Screening Criteria (ppmw)**	**Percent of Plant Screening Criteria**
Arsenic	3.02E-04	3	0.0	4.23E-05	0.25	0.0
Cadmium	1.63E-03	2.5	0.1	1.74E-02	3	0.6
Chromium	3.78E-03	8.4	0.0	7.56E-05	1	0.0
Copper	1.23E-03	40	0.0	5.76E-04	0.73	0.1
Lead	8.30E-04	1000	0.0	3.73E-04	126	0.0
Mercury	3.71E-04	455	0.0	1.85E-04	NA	NA
Nickel	3.31E-03	500	0.0	1.49E-04	60	0.0
Selenium	7.08E-05	13	0.0	7.08E-05	100	0.0
Vanadium	3.40E-03	2.5	0.1	3.40E-05	NA	NA

Note: Based in screening procedures described in Chapter 5 of the EPA guidance document for soils and vegetation, "A Screening Procedure for the Impacts of Air Pollution Sources on Plants, Soils, and Animals."

IX. Mass Based Emission Limits

To ensure the NAAQS and increment are not violated, a PSD Permit must contain enforceable permit terms and conditions which ensure the mass flow rates for each modeled pollutant are not exceeded. This is accomplished by establishing mass-based emission limits for each modeled pollutant with or without the use of CEMS. When a CEMS is used, the PSD Permit must establish the averaging time for each mass-based emission limit that ensures compliance with the NAAQS. Without a CEMS, the applicable stack test method establishes the averaging time by default. Footprint is required to install CEMS for both CO and NO_x, therefore averaging times for these pollutants are specified in the Permit.

The Draft PSD Permit contains the mass-based emission limits Footprint used in demonstrating compliance with the NAAQS and increment, and are therefore enforceable emission limits in the PSD Permit.

X. Environmental Justice

The PSD Delegation Agreement specifies that MassDEP identify and address, as appropriate, "disproportionality high and adverse human health or environmental effects of federal programs, policies, and activities on minority and low-income populations," in accordance with Executive Order 12898 (February 11, 1994). Footprint considered draft federal guidance[3] as well as the Massachusetts Executive Office of Energy and Environmental Affairs (EOEEA) Massachusetts-specific Environmental Justice (EJ) Policy in preparing an EJ assessment for the SHR Project. MassDEP reviewed the EJ assessment and agrees that the analysis satisfies both state and federal requirements.

The EPA defines EJ as "the fair treatment and meaningful involvement of all people regardless of race, color, national origin or income with respect to the development, implementation, and enforcement of environmental laws, regulations and policies. Fair treatment means that no group of people, including a racial, ethnic, or socioeconomic group, should bear a disproportionate share of the negative environmental consequences resulting from industrial, municipal, and commercial operations or the execution of federal, state, local, and tribal programs and policies."[4]

As demonstrated in Footprint's Application, Supplements, and as further set forth below, no such group of people will bear a disproportionate share of negative health or environmental consequences from the issuance of a PSD Permit to Footprint as (1) the SHR Project will not be located in or abutting an EJ area; (2) nearby EJ communities have been provided with several opportunities to participate in the permitting process; and (3) the SHR Project meets all applicable air emissions standards and would not cause or contribute to a violation of the health-based National Ambient Air Quality Standards. Moreover, the resulting regional emission reductions will benefit all communities, including EJ areas.

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3 US EPA, "Draft Technical Guidance for Assessing Environmental Justice in Regulatory Analysis", May 1, 2013 Post-Internal Agency Review Draft.

4 US EPA, Basic Information: Environmental Justice. http://www.epa.gov/environmentaljustice/basics/index.html

Identification of Environmental Justice Areas

The Commonwealth of Massachusetts Executive Office of Energy and Environmental Affairs (EOEEA) Geographic Information System (GIS) includes EJ areas divided by block groups based on the 2010 US Census data.[5] The block groups are based on the number of people generally ranging from 500 to 2500 people as opposed to physical boundaries such as streets or rivers. There are three main EJ classifications in the EOEEA EJ Policy (which is more expansive than the EPA policy) - Minority, Low Income, and English Isolation (referred to as "Lacking English Language Proficiency" in the EOEEA Policy):

- "Minorities" under the EOEEA Policy are individuals who refer to themselves on federal census forms as "non-white" or as "Hispanic," which is broader than the EPA EJ definition. Any block group with 25 percent or more minority population is considered to be an EJ area.

- Income of approximately 65% of the median annual household income is considered low income. In Massachusetts median income is based on the state median household income of $62,133 per year. Thus, any block group with a median annual household income of $40,673 or less is considered to be an EJ area.

- English Isolation is any household in which members 14 years old and older speak a non-English language and also speak English less than "very well" (i.e., are not proficient in English). Any block group with 25% or more of households as English Isolated is considered to be an EJ area.

Based on EJ mapping completed by EOEEA, the SHR Project does not abut any EJ areas and is not located within 1 kilometer of any EJ areas. However, the site is within approximately 10 kilometers of a number of EJ communities in Salem, Lynn, Peabody, Danvers and Beverly. The closest EJ areas are classified as Minority/Low Income and Minority/Low Income/English Isolation and are located approximately 1.2 kilometers (¾ of a mile) to the southwest of the SHR Project property boundary. A portion of this area is known as the "Point Neighborhood."

The Point was originally surrounded by water on three sides and was known as Long Point or Stage Point. There were fish shacks and mill buildings in this area originally. In the mid 1880's the Naumkeag Steam Cotton Company built its first mill along the South River in the area of current day Shetland Park. Immigrants, mainly French Canadians, settled in this area and provided the labor force for the textile mills. The area was filled in to provide housing and more mill buildings. The Great Salem Fire of 1914 destroyed this area but it was quickly rebuilt. The area thrived until the 1950's when the textile industry moved to the south. Over the past few decades, many Spanish-speaking immigrants have settled in this area.

There are several additional areas in Salem located further than 10 km from the SHR Project property and these are classified as containing low income and minority populations.

5 2010 census data is the latest demographic data available. http://www.mass.gov/mgis/ej_boston_metro.pdf

Public Participation

Footprint has conducted informational meetings, answered questions, and translated presentations in non-English languages, in response to public interest and to encourage public participation. The following is a summary of the public outreach, including outreach to EJ communities, conducted over the past year.

- Notification of Filing an Environmental Notification Form (ENF) under the Massachusetts Environmental Policy Act (MEPA) – August, 2012

A legal notice of the availability of the ENF was published in the Salem News in English, Spanish and Portuguese on August 8, 2012. It was also published in the Marblehead Reporter in English on August 9, 2012. Additional publication of the Legal Notice of Environmental Review was published in English, Spanish and Portuguese in the Boston Globe on August, 18, 2012, the Lynn Daily Item on August 21, 2012 and in the Danvers Herald, the Beverly Citizen and the Peabody-Lynnfield Weekly News on August 23, 2012.

- Energy Facilities Siting Board (EFSB) Public Hearing, Salem MA – September 19, 2012

The following actions were taken by Footprint for the EFSB Hearing:

- Placed Notification advertisements in both English and Spanish in the Boston Globe, Salem News, and Spanish Paper El Mundo.

- Placed English and Spanish Legal Notice of the of EFSB Petition, stating Footprint's Development plans and the date/location of upcoming EFSB hearings, in the following locations: Salem Public Library, City Clerk's Office, North Shore Community Development Coalition, Salem Housing Authority, and ABE/ESOL Training Resources of America (Salem Office). English copies of the EFSB Petition were also placed in these locations. Notification of the placement of these EFSB documents in both English and Spanish was placed in the EFSB advertisements in all three papers.

- Mailed EFSB Notice to abutters of existing Salem Harbor Station.

- Retained services of Spanish translator for EFSB hearings, to both translate information as it was presented, and to translate questions presented from the public in Spanish.

- Offered to meet with interested members of the public along with Spanish translator.

- Presentation to Historic Derby Street Neighborhood Association, November 12, 2012

In addition to the presentation, Footprint offered to Linda Haley, Chairperson, that its representatives would meet with individual residents to answer questions if requested.

- Draft Environmental Impact Report, December 2012

Notice of the public scoping meeting and site visit was sent to Beverly, Lynn, Salem, Peabody, Marblehead, and Danvers. Notification of the availability of the Draft Environmental Impact Report was published in the Boston Globe, the Salem News, the Marblehead Reporter, the Beverly Citizen, the Danvers Herald, the Lynn Daily Item and the Peabody-Lynnfield Weekly News in English, Spanish and Portuguese. These notices appeared on December 19 and December 20, 2012 with the exception of the Marblehead Reporter notice which appeared on December 27, 2012.

- Presentation to the Salem Harbor Power Plant Stakeholders Group, January 22, 2013

Members have been appointed by Salem Mayor Kim Driscoll. The Stakeholders are those individuals who represent abutters to the plant, city officials whose position speaks for abutters (e.g., City Councilors, state elected officials, etc.). Footprint has made a pledge to respond to all requests for information (English or Spanish), and to openly discuss Community needs and requests.

- Presentation to The Point Neighborhood Association, February 25, 2013

Lucy Curchado, Chairperson. Footprint provided a Spanish Translator. The presentation was translated to Spanish sentence for sentence by the translator. Much of the Point leadership attended the meeting and many questions were asked. The translator obtained questions from the Point membership, translated those questions into English so they could be answered by Footprint representatives, and then translated back into Spanish in response to the questioner. Footprint offered to either meet with any members and provide a Spanish interpreter, or to respond in writing (Spanish) to questions if submitted.

- Public Presentation at the Bentley Elementary School, February 26, 2013

At Mayor Driscoll's request, Footprint made a presentation to the general public. The public was invited to ask questions and/or request additional information.

- Final Environmental Impact Report, April 4, 2013

Notification of the availability of the Draft Environmental Impact Report was published in the Boston Globe, the Salem News, the Marblehead Reporter, the Beverly Citizen, the Danvers Herald, the Lynn Daily Item and the Peabody-Lynnfield Weekly News in English, Spanish and Portuguese on April 4, 2013.

- Salem Planning Board Meetings, May 2, 2013, May 6, 2013, and June 6, 2013

These meetings were continued to June 20, 2013 and were held at Bentley Elementary School. They were open to the public.

- Ongoing coordination with Lucy Curchado, Chairperson of the Point Neighborhood Association

Footprint is in the process of translating its most recent/complete power point presentation into Spanish for distribution to the membership. Footprint has offered to translate, provide information, and/or respond to any other issues, questions or concerns of the Neighborhood Association.

Impact Analysis

Prior to 1949 the site was used for commercial purposes related to the handling of coal and oil. The first power plant built on the site was a coal-fired unit that commenced operation in 1951. A second coal-fired generation unit commenced operation in 1952, and a third coal-fired unit was added in 1958. In 1978 a fourth, oil-fired, unit was added. The existing facility has operated as a grandfathered facility (that did not have to meet emissions standards applied to new power plants) for many years and may not have been able to be built under today's environmental regulations. However, the existing facility did provide a significant economic value to the residents of Salem in tax payments. The proposed SHR Project will result in significant decreases of air pollutant emissions, not just as compared with the existing facility, but also regionally, while providing a tax benefit to the City of Salem and its residents.

Once operational, the SHR Project will be among the most efficient fossil-fueled fired electric generators in the Northeast Massachusetts (NEMA) zone and is expected to provide 5.1 million MWh of electricity annually. This additional supply will reduce the need for generation from other power plants with lower efficiency and higher operating costs, primarily fueled by natural gas, oil, and coal. Charles River Associates, a consultant to Footprint, has conducted an analysis projecting the operation of the New England bulk power system over the period 2016-2025, for scenarios with and without the SHR Project in service, and quantified the expected changes in air emissions by the project directly and the associated reductions of emissions at competing plants elsewhere in New England and, in particular, Massachusetts. MassDEP has reviewed the CRA study and agrees that because the SHR Project would displace other, less efficient generation on the New England grid, operation of the SHR Project would reduce regional air emissions by 457,626 tons (1.3%) of CO_2, 984 tons (10%) of NO_x, and 888 tons (8%) of SO_2 annually.

Health Risk Assessment

Footprint commissioned a health risk assessment (HRA) to assess the potential for human health risk associated with the SHR Project.[6] Gradient Corporation prepared the human health risk assessment evaluating the likelihood of both acute non-cancer health risks and chronic non-cancer and cancer health risks that may result from people's inhalation of airborne pollutants for SHR Project stack air emissions. Gradient also collected relevant background health information for Salem and surrounding communities to determine if any types of disease (*e.g.,* cancer and asthma) were higher than expected compared to Massachusetts as a whole.

Footprint states that the HRA indicates that maximum predicted air levels of specific substances associated with SHR Project air emissions would not be expected to contribute to adverse health effects among potentially affected populations. Footprint states that several separate lines of evidence from the

6 Gradient Corporation, "Health Risk Assessment (HRA) for the Salem Harbor Redevelopment (SHR) Project", January 4, 2013.

HRA support the conclusion that the potential air emissions from the SHR Project are not expected to have an adverse effect on public health in the Salem area. Footprint states that these include the following:

- The maximum cumulative air concentrations (project impact plus existing background) of the criteria pollutants of concern, which include SO_2, CO, NO_2, and PM, are well below the health-protective NAAQS. NAAQS are set to protect human health with a wide margin of safety even for sensitive populations. Stack emissions of criteria air pollutants are thus not expected to lead to impacts on human health (*e.g.*, asthma, cardiovascular and respiratory diseases) in nearby communities, even in sensitive populations.

- For possible non-cancer effects, all hazard quotients (HQs), calculated for an off-site resident exposed to maximum modeled incremental SHR Project stack impacts, were well below unity (HQ = 1), with none being higher than HQ = 0.01. The overall summed HI for SHR Project stack emissions is also well below 1.0, *i.e.*, HI = 0.08. These results help assure that non-cancer, adverse health effects are not to be expected from the non-criteria air-pollutant emissions.

- Conservatively projected cancer risks for maximum modeled SHR Project stack impacts of possible carcinogenic chemicals were well below the 1 in 10,000 to 1 in 1,000,000 lifetime risk range, which is considered to be acceptably low by EPA. The overall summed cancer risk from the SHR Project was about 1 in 10,000,000 over a lifetime, which is well below the EPA *de minimis* risk level. The individual pollutant cancer risks were each even lower than the *de minimis* level, between about 1 in 10,000,000,000 and about 4 in 100,000,000. These results support *de minimis* cancer risk from worst-case chronic exposures to maximum modeled SHR Project stack impacts.

- Based on the air-modeling results, short-term SHR Project air emissions impacts are not expected to give rise to acute health effects. SHR Project-related maximum short-term concentrations of SO_2 and NO_2 were compared to short-term exposure guidelines and standards, including the short-term NAAQS for SO_2 and NO_2 which were specifically designed to protect against asthma exacerbation and respiratory irritation. The comparisons show that the cumulative impacts (maximum 1-hour plus ambient background) for NO_2 and SO_2 are well below the 1 hour health-protective NAAQS as well as other short-term exposure guideline levels.

- Gradient stated that review of community health data for Salem and nearby communities confirms that the Salem area has overall similar rates of asthma, cardiovascular conditions, and cancer compared with the state as a whole. In combination with the results of the HRA, Gradient concluded that air emissions from operation of the proposed SHR Project are not expected to significantly alter any of these baseline health statistics.

Additional Analysis of Surrounding Areas

The maximum criteria air pollutant impacts from the SHR Project were also compared to the EPA- and MassDEP-adopted significant impact levels (SILs). SILs are impact levels set at only a few

percent of the ambient air quality standards and below which the regulatory agencies consider impacts to be insignificant.[7] Impacts above the SILs are not considered significant, per se, but rather additional modeling is required to demonstrate that the proposed project will not exceed the NAAQS. A significant impact area (SIA) is the area of a circle having the radius of the maximum distance from a source to the point at which concentrations drop below the SIL. The SIA is used as a basis for analysis not because of any concern that emissions impacts *inside* the SIA are adverse - since they are below the NAAQS, they are by definition *not* adverse - but rather because impacts *outside* the SIA are so insignificant as to be *de minimis.* In EJ analyses, the SIA is often presented on a direction specific basis and represents all receptors with projected impacts above the SIL.

The dispersion modeling completed for the SHR Project and described elsewhere in this Fact Sheet, demonstrates that the predicted maximum impacts from the SHR Project for the majority of criteria air pollutants are below the SILs at all locations and therefore, represent no adverse human health or environmental effects to Salem and outlying communities. The predicted impacts of the SHR Project result in slight to moderate execedances of SILs for only $PM_{2.5}$ (24-hour average concentrations), and NO_2 (1-hour concentrations). Since the SILs are set considerably lower than the NAAQS, the modeled emissions do not necessarily mean a project's impacts would be unhealthy or would have an adverse effect on any population. Footprint evaluated these as a way to determine if an EJ area would be disproportionately subject to higher air impacts than other segments of the community at large.

The following sections describe the maximum modeled impacts for the only two pollutants with maximum impacts exceeding their respective SIL with specific reference to the SIAs in reference to nearby EJ areas versus other nearby areas.

NO_2 Analysis

The 1-hour NO_2 SIL is 7.5 µg/m^3. The 1-hour NO_2 isopleths (i.e., maximum pollutant impact concentration contours associated with emissions from the SHR Project) were prepared for the Salem region and these isopleths show the following:

- There are two small areas of isolated peak NO_2 one-hour concentrations (in the range of 36 to 42 µg/m^3 and well below the NAAQS of 188 µg/m^3). These are located very close to the SHR Project site to the northeast and southwest of the power plant stack. These areas are not close to any EJ areas.

- Maximum concentrations beyond approximately 1 kilometer from the SHR Project's main stack are less than approximately 16 µg/m^3 and thus are all less than 10% of the health based NAAQS. However, the SIA of 7.5 µg/m^3 extends as far as 14 kilometers beyond the Footprint property line extending into Salem, Beverly, Marblehead, Middleton, Wenham, Danvers, Peabody, Lynn, and Swampscott. While this encompasses all of the EJ areas in Salem as well as some in Beverly, Danvers, Middleton and Lynn, the population associated with the EJ areas within the SIA is a small percentage of the total population within the SIA.

7 For example, the 1-hour NO_2 SIL is 7.5 microgram per cubic meter versus the health based standard of 188 micrograms per cubic meter and the 24 hour $PM_{2.5}$ SIL is 1.2 microgram per cubic meter versus the health based standard of 35 micrograms per cubic meter. These SIL concentrations are only 3 to 4 percent of the NAAQS.

The results of this assessment demonstrate that the SHR Project's NO_2 impact concentrations will not have disproportionately high human health or environmental effects on EJ areas.

$PM_{2.5}$ Analysis

Isopleths of maximum 24-hour average predicted concentrations from the SHR Project were also prepared. These isopleths show the following:

- The highest 24-hour $PM_{2.5}$ concentrations are only a small fraction of the health based NAAQS (3 to 4 $\mu g/m^3$ compared to the 35 $\mu g/m^3$ NAAQS). These areas of highest impact are localized and generally occur either on plant property, in areas immediately adjacent to the site, or in Salem Harbor adjacent to the Salem shoreline.

- The 24-hour $PM_{2.5}$ SIL is 1.2 $\mu g/m^3$ and this SIA encompasses a two city block area of a low income EJ area just south of the South River. However, the vast majority of the SIA is within Salem Harbor or consists of residences and businesses in the Salem downtown area along Derby Street. It also encompasses Winter Island and a portion of the Salem Willows Park. The EJ area represents a very small percentage of the total population within the SIA.

The results of this assessment demonstrate that the SHR Project's $PM_{2.5}$ emissions will not have disproportionately high human health or environmental effects on EJ areas.

CO_2 Benefits

The EPA's May 1, 2013 Draft EJ Guidance states, "The U.S. Climate Change Science Program stated as one of its conclusions: The United States is certainly capable of adapting to the collective impacts of climate change. However, there will still be certain individuals and locations where the adaptive capacity is less and these individuals and their communities will be disproportionally impacted by climate change. Therefore, these specific population groups may receive benefits from reductions in greenhouse gas (GHG) emissions." Operation of the SHR Project is actually projected to *reduce* (on a net basis*)* annual regional GHG emissions by approximately 457,626 tons of CO_2, even after taking into account the SHR Project's own CO_2 emissions. This is based on the study done by Charles River Associates provided as Appendix C of the DEIR prepared for the SHR Project. The CO_2 reduction represents approximately 1.3% of the regional CO_2 emissions from power plants.

Conclusion

The proposed SHR Project is not located in or adjacent to an EJ area, and MassDEP hereby finds that there will be no disproportional adverse health or environmental impact to any such community. Indeed, the proposed SHR Project will be an improvement over emissions from the existing facility, and will reduce regional emissions of NO_x, SO_2 and CO_2 to the benefit of all area residents. Footprint has demonstrated that emissions from the proposed SHR Project itself will be well within the NAAQS, which are designed to be health-protective of the most sensitive populations.

The above-discussed analyses and actions fulfill MassDEP's obligations under the Delegation Agreement and fulfill all obligations under Executive Order 12898 and EPA Environmental Justice Policy.

XI. National Historic Preservation Act, Endangered Species Act, Tribal Consultation

Section IV. of the PSD Delegation Agreement contains the requirements for Applicants (e.g., Footprint), MassDEP, and EPA with regards to the PSD Program. Under the PSD Delegation Agreement, EPA must engage in consultation as required by federal law before MassDEP issues PSD Permits.

Section IV.H.3. states that "If EPA requires more time to consult with an Indian tribe before issuance of a Draft PSD Permit, refrain from issuing the Draft PSD Permit until EPA informs MassDEP that it may do so." In addition, Section IV.H.4. states that "In all cases, MassDEP will refrain from issuing any Final PSD Permit until EPA has notified MassDEP that EPA has satisfied its NHPA, ESA, and Tribal consultation responsibilities with respect to that Permit."

In an April 18, 2013 letter from Tetra Tech to EPA Region 1, Tetra Tech asked EPA to notify MassDEP that EPA has satisfied its consultation responsibilities for the proposed SHR Project's PSD Permit. The letter included several attachments sent to various State, Federal and Tribal agencies responsible for their respective National Historic Preservation Act (NHPA), Endangered Species Act (ESA), and Tribal programs. EPA Region 1 reviewed Tetra Tech's letter and attachments and concluded in its September 5, 2013 letter to MassDEP that it had satisfied its NHPA, ESA, and Tribal consultation responsibilities with respect to Footprint's PSD Permit.

The following sections outline how the NHPA, ESA, and Tribal consultation requirements identified under the PSD Delegation Agreement have been met.

National Historic Preservation Act

On August 18, 2013, Tetra Tech submitted a letter to the Massachusetts Historic Commission (MHC) notifying the MHC of Footprint's submittal of a PSD Permit Application for the proposed SHR Project. The letter explained that Tetra Tech reviewed the National and State Register files and the Inventory of Historic and Archaeological Assets of the Commonwealth at the MHC. The file search did not identify any previously identified historic or archaeological resources within the proposed SHR Project site.

The proposed SHR Project was also subject to a full Massachusetts Environmental Policy Act (MEPA) review. As part of the MEPA review, a MEPA Environmental Notification Form (ENF) was distributed to the MHC in August 2012. The MHC did not submit comments on the ENF to the MEPA office. Accordingly, EPA found that NHPA consultation requirements for the proposed SHR Project have been satisfied.

Endangered Species Act

Section 7 of the Endangered Species Act (ESA) requires that certain federal actions such as federal PSD Permits address the protection of endangered species in accordance with the ESA.

On April 18, 2013, Tetra Tech submitted a letter to Thomas R. Chapman, Supervisor, New England Fish and Wildlife Service (FWS) field office notifying the FWS office of Footprint's submittal of the PSD Permit Application for the proposed SHR Project. The letter stated that Footprint is aware of and understands current ESA consultation procedures outlined on the FWS website. The website provides an endangered species consultation process in which the Applicant conducts the initial consultation. Tetra Tech reviewed the data for Essex County and identified two endangered species, the small whorled Pogonia plant and the piping plover. Tetra Tech determined the presence of the two species is limited to either the woodlands or the coastal beaches and are not present in the City of Salem where the proposed SHR Project will be located. Tetra Tech concluded that the proposed SHR Project does not pose a threat to any currently identified or proposed endangered species or their habitats in the area subject to FWS jurisdiction and as a result, no further ESA impact analysis is required. In a November 28, 2012 letter from Thomas R. Chapman, FWS, to Lisa Carrozza, Tetra Tech, FWS confirmed that no federally listed, proposed, threatened or endangered species or critical habitat are known to occur in the proposed SHR Project area and that no further ESA coordination is necessary.

In addition, on April 18, 2013, Tetra Tech submitted a letter to John Bullard, Regional Administrator, National Oceanic and Atmospheric Administration (NOAA) National Marine Fisheries Service (NMFS), Northeast Regional Office, which notified (NMFS) of the PSD Permit Application submittal. The letter described the proposed SHR Project and its location at the existing Salem Harbor Station and concluded that the changes will reduce net regional emissions of air pollutants due to displacement of other, less efficient electrical generation on the New England electric grid.

Based on the letters to FWS and NMFS, EPA found that ESA consultation requirements for the proposed SHR Project had been satisfied.

Tribal Consultation

On April 18, 2013, Footprint submitted separate letters to the Tribal Environmental Directors and the Tribal Historic Preservation Officers for the Wampanoag Tribe of Gay Head (Aquinnah) and Mashpee Wampanoag Tribe. The letters notified the Tribes of the proposed SHR Project's PSD Permit Application and described how the proposed SHR Project will reduce net regional emissions of air pollutants due to displacement of other, less efficient electrical generation on the New England electric grid. In addition, EPA notified the tribes about Footprint's proposed SHR Project in a follow-up E-mail message. As of this date, neither Tetra Tech nor EPA has received any comments from the Tribes.

XII. Comment Period, Hearings and Procedures for Final Decisions

All persons, including Applicants, who believe any condition of the Draft Permit is inappropriate must raise all issues and submit all available arguments and all supporting material for their arguments

in full by the close of the public comment period, to Cosmo Buttaro of MassDEP at the address listed in Section XIII of this Fact Sheet.

A public hearing will be held during the public comment period. See the public notice for details. MassDEP will consider requests for extending the public comment period for good cause. In reaching a final decision on the PSD Permit, MassDEP will respond to all significant comments and will issue a Response to Comments document.

Following the close of the public comment period, and after the public hearing, MassDEP will issue a Final Permit decision and forward a copy of the final decision to the Applicant and each person who has submitted written comments or requested notice. Within 30 days following the notice of the permit decision, any interested parties may submit a petition for review of the Permit to MassDEP's Wilmington Office, which is consistent with appeal requirements specified in 40 CFR 124.19.

The Energy Facility Siting Board (EFSB) has not issued approval under M.G.L. Chapter 164, § 69J¼ of the Permittee's Petition to construct and operate the Facility at the time of issuance of this Proposed Plan Approval. Among other things, Section 69J¼ provides that "…no state agency of the Commonwealth shall issue a construction permit for any such generating facility unless the petition to construct such generating facility has been approved by [EFSB] ….". Accordingly, MassDEP will not issue a final plan approval or PSD permit until EFSB has issued the approval required by Section 69J¼.

XIII. MassDEP Contacts

Additional information concerning the Draft PSD Permit may be obtained between the hours of 9:00 a.m. and 5:00 p.m., Monday through Friday, excluding holidays from:

Cosmo Buttaro
MassDEP Northeast Regional Office
205B Lowell Street
Wilmington, MA 01887
(978) 694-3281
Cosmo.Buttaro@State.MA.US